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ABSTRACT

Following a discussion of the historical background of the TV series "Infinity Factory," the goals of the television project are listed. A general description of the television series, an evaluation of the entertainment value, and an evaluation of children's attitude change are briefly presented. The program's presentation of mathematics content is described and evaluated. A discussion concerning means for implementing the TV program in the classroom concludes this report. (DT)

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A REVIEW OF "INFINITY FACTORY"

At the request of John Egsgard, president of the National Council of Teachers of Mathematics (NCTM), an ad hoc committee was formed to examine the TV series "Infinity Factory" prior to its debut on national PBS television in September 1976. The committee was asked to determine whether NCTM could assist teachers or others in making use of the TV shows. The committee members were Catherine Tobin, Math Specialist, Lexington, Massachusetts, public schools, Chairman; Patricia Davidson, Professor of Mathematics, Boston State College, Boston, Massachusetts; Mary Ann Jackman, teacher, Boston, Massachusetts, public schools; Hattie McKinnis, parent, Boston, Massachusetts; Jean McManamy, teacher, Cambridge, Massachusetts, public schools.

The committee met with Jerrold Zacharias and Mitchell Lazarus, representatives of the Project, to gather the information that would be necessary to evaluate the programs.

Also, before viewing the programs, committee members were given copies of the program guides; informational sheets listing background, philosophy, and goals; and articles from newspapers and magazines that appeared around the time the series was field tested. The committee viewed "Infinity Factory" for two full days, with full access to all fifty-two programs. Selections for viewing were made from each of the five areas: decimal number system, measurement, estimation, mapping and scaling, and graphing. In addition, a conscious effort was made to view shows at various stages in the airing schedule and in the mathematical development of each topic. Each show was seen in its entirety and was followed by discussion. Questions that arose during the viewing were later directed to Jerrold Zacharias and Mitchell Lazarus, who were available to the committee throughout the entire evaluation.

This process, which included briefings by the staff of the Educational Development Center (EDC), gathering information, reading literature, viewing a wide sampling of programs, discussions, examining topics, and interacting with the EDC staff, created a total experience that provided the committee with more than adequate information to complete its assessment. The following report is a joint effort of the full committee, based on many hours of discussion.

HISTORICAL BACKGROUND

"Infinity Factory" is the idea of Jerrold Zacharias, professor emeritus of physics at Massachusetts Institute of Technology, who has long been concerned about what he calls "mathophobia." Determined to make math less formidable, Zacharias in 1974 assembled a team of educators at the Educational Development Center in Newton, Massachusetts. With the help of a $4-million grant from the United States Office of Education, the group created a series of 65 TV programs (fifty-two different shows with thirteen repeated) aimed at eight- to eleven-year-olds, with the focus on minority children.

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GOALS

The goals, as presented to the committee, were as follows:

> "to present mathematics in a common-sense way that help children understand the usefulness of mathematics in their own lives;
>
> to present and explore positive ethnic perspectives, helping minority viewers maintain a positive self-image and good feelings about their own culture;
>
> to help young people, especially minorities, become more comfortable with and better at mathematics;
>
> to help children appreciate and share one another's cultures and heritages, showing people of different ethnicities and backgrounds interacting positively and productively."

Television was chosen as the medium to reach these goals. Because it was decided to develop a series of programs intended primarily for home viewing, entertainment became the most important priority. The priorities then fell in order--entertainment, attitude change, and mathematical content.

THE TELEVISION SERIES

"Infinity Factory," produced by Jesus Salvadore Trevino, attempts to improve attitudes toward mathematics by offering entertainment that shows people using mathematics in an everyday setting. The show is in the tradition of instructional entertainment like "Sesame Street" and draws on techniques from other shows that have been successful in reaching children, such as "Zoom," "Electric Company," and "Laugh-in." The program also aims at presenting minority viewpoints and attitudes, ethnic confidence and pride, and positive roles for females.

Each program is built around a single math concept, which is developed in each of three neighborhood scenes. The Brownstone set, filmed in Boston, is a scene of music, games, and dance. Both Scoops' Place, a black family store in New York City, and City Flats, which is a Chicano area in Los Angeles, provide settings for a wealth of mathematical situations. These scenes are interspersed with animation; kids dancing frantically to music; "Coolidge Cool Breeze," the disc jockey; and math-on-the-street interviews.

One program on problem solving opens with the children at the Brownstone naming things they could buy for $5. An animation of peanut-character workmen estimating how many bricks they need to pave a walk is followed by a math-in-the-street interview asking "When was the last time you multiplied?" In City Flats, Apple and his friends, using estimation, realize that their benefit car wash is in trouble. A peanut character estimates how many children his dirigible will hold. Scoops, Mrs. Marie, Max, Gregory, and Sugar Pie estimate whether they can afford to hire Barry White for a church benefit concert. Flashed through the show are the math facts related to $8 \times 7 = 56$.

EVALUATION OF ENTERTAINMENT

The half-hour segments went quickly for each of the committee members. The committee found the shows entertaining and anticipate that children will also find them entertaining. Each show has variety; the selection of characters is ethnically balanced; and the

repetition from show to show is sufficient for children to become familiar with the characters and scenes. Coolidge Cool Breeze, the disc jockey with large sunglasses, will probably be one character whom the children will imitate. Scoops' Place is similar to a children's club house, where everything is discussed. The rock music and dancing will attract many.

EVALUATION OF ATTITUDE CHANGE

The importance of group interaction in solving problems prevails through all the shows. The series takes children seriously and considers them significant--the children shown have self-confidence, and they can solve their own problems. Adults are also shown working together to solve problems.

For children who have little or no interest in mathematics, the material shown should help develop a more positive attitude. They are watching a "math show" that is entertaining, where children and adults are using mathematics successfully. The themes focus on areas that some children may never have realized were mathematics.

An attempt was made to show an appreciation of the diverse and valuable contributions minority peoples bring to American life. The use of a short segment showing children viewing slides of important people was not as successful as other aspects. It seemed to be imposed on the show and would be of more interest to adults.

PRESENTATION OF MATHEMATICS CONTENT

The mathematics presented in each of the shows of "Infinity Factory" concentrates on one of five main areas--decimal number system, measurement, estimation, mapping and scaling, and graphing. This range of topics was selected to broaden the mathematical perspectives of children, parents, and teachers. "Infinity Factory" was not designed to be a total curriculum but rather to mesh with, and lend reality to, the mathematics taught in the classroom.

Each program shows people actively doing math in a variety of practical situations. The emphasis on realistic uses of mathematics helps to show the audience when and why math is used and not just how.

The mathematics is presented differently in each of the three neighborhood scenes. Typically, the scenes in City Flats take place in different areas of the neighborhood. The camera catches all the action of the children from the conception of a project to its completion. The scope of the projects includes organizing a car wash, taking a bicycle trip, planning a camping trip, baking an anniversary cake, setting up a raspada stand, and helping with inventory.

As the action moves along, the math unfolds and becomes the solution to a dilemma in a practical context--repricing becomes the solution to the rising cost of supplies at the raspada stand; estimating chocolates speeds up the inventory at Julio's Panadería; drawing a map to scale helps complete a bicycle trip. In all City Flats scenes math comes to the rescue for a happy ending.

The world comes in and out of Scoops' Place, a typical variety store with a soda fountain. In contrast to City Flats, all the problem situations take place within one room. The mathematics serves as a catalyst for the sharing of real human feelings, attitudes, and values. At Scoops' Place the wide variety of people talking about their individual needs ensures a broad scope of math situations involving people of all ages, backgrounds, and cultures.

In most cases, problems are solved through simulation. When the adults need a meeting place for their church group, they verify the possibility of fitting forty-five seats into Scoops' Place by estimating with a few chairs. On a rainy day when Albert needs a house for his new dog, Gregory helps him measure the dog and make scale plans for the doghouse. Scoops shows them how to change the scale in order to make the doghouse bigger--after all, every puppy does grow!

The Brownstone set is the unifying factor for the whole program. The show opens with a song, dance, or question in short fast clips that set the tone and theme for the program. Within the segment the camera may flash to rock dancing or Coolidge Cool Breeze with number facts, the group watching slides of minority history, or some short immediate problem-solving situation.

Other short segments are the on-the-street interviews and animation. The interviews are amusing, entertaining, and thought-provoking. The question becomes blatantly obvious only after a number of bystanders have expressed answers--for example, "What percent of the day do you spend talking?" The animation, however, is instructional and focuses on the building of math concepts. The animated characters Mapman, Caveman, Rita Cheetah, Peanut Prates, and Caterpillar provide instruction in map reading, rounding off numbers, measuring with metric units, measuring the distance to a buried treasure, and coordinate geometry.

EVALUATION OF MATHEMATICAL CONTENT

Viewing "Infinity Factory" verified the fact that mathematical content is placed at a lower priority than the entertainment value and attitude change. Nevertheless, each program does consist of two or three math skills or concepts around a central mathematical theme, and the mathematics presented is sound. Even though the programs within one math topic are nonsequential, the accumulated effect of viewing a large number of them will no doubt have a strong impact.

The selection of topics--measurement, estimation, mapping and scaling, and graphing--is a good one, since these areas are sometimes neglected or inadequately covered in the curriculum. These concepts are well suited to the medium of TV, being both visual and physical. The shows dealing with the decimal number system seem contrived and less suited to the TV medium. The presentation of the math in these topics lends itself to jumping-off points for further classroom work.

The developers of "Infinity Factory" felt they did not have the best medium to teach computational algorithms, and they made no attempt to do so. The general format in each show is to go from the physical situation to the abstract mathematical solution without

showing the intervening steps needed to perform the computation. Teachers will need to fill such gaps as how to multiply two-digit numbers, how to multiply with tens and hundreds, or how to operate with fractions. The films can provide a motivation for students to learn these computational skills.

Furthermore, no attempt was made to use concrete materials or manipulatives to model abstract concepts, nor was mathematics approached through number patterns, both of which could have been effectively done through animation. For example, Coolidge Cool Breeze repeats several times that 9 + 8 = 17, but there is no justification given for this fact. There are effective ways of showing this, such as viewing 9 + 8 as one more than 8 + 8, or completing the 9 with one more to make 10 by taking one from the 8, but they were not used. The sprinkling of multiplication facts were also treated in a superficial way. In this regard, the shows seemed to lack creativity and understanding of childrens' learning behavior.

IMPLEMENTATION

The composition and scheduled airing times of "Infinity Factory" provide a variety of viewing possibilities. A child may watch the program at home alone, at home with a parent, in school with no teacher input, or in school with teacher input. Also, a child might watch the two scheduled programs each week or only one show.

Since the entertainment quality of "Infinity Factory" is high, this committee feels that each of the options named above provides wholesome entertainment for children. However, the degree of mathematical application and further learning depends on the activities of a parent or teacher.

The committee endorses "Infinity Factory" as something children should watch at home. It is positive, and every boy and girl can gain something from viewing it. The prime benefit of the show is that children will see beyond the computational aspect of math, since they will be exposed to such areas as estimation, mapping and scaling, graphing, and measurement. This exposure will likewise be beneficial to parents. The committee feels that an attitude change may take place with adults as well as children. Parental input before, during, and after a half-hour segment would result in optimum utilization of the mathematical aspects by children. Program guides have been written to provide information concerning the contents of each show and suggested activities. These can be requested from the local school system.

In school the commitment to watching can range from the occasional use of a program to the planned incorporation of two half-hour shows each week into the existing curriculum. Since school hours are limited and since it is incumbent on teachers to use their time for the maximum development of each child, the committee members do not endorse devoting a half hour of math time each week to looking at this program or making "Infinity Factory" the basis of a total program. However, the committee would endorse twice-a-week viewing on a regular basis in addition to the math time so that these skills and attitudes could also be incorporated into other subject areas. The committee endorses these programs as an introduction to estimation, mapping and scaling, graphing, and measurement.

Obviously, a viable television learning situation involves input from the teacher. The program guides give a descriptive listing of each segment of a show and suggested preshow and postshow activities. The program guide can be used to scan the content of individual programs and assess their mathematical concepts. But it should be noted that the suggestions provided are not adequate for the degree of follow-up that the committee feels should take place. The "After The Program" section of the guide does not provide ample or relevant activities. Consequently, teachers will have to plan their own introductory and follow-up activities.

Since one of the two shows presented each week during school hours is repeated on Saturdays, teachers might wish to check the local TV schedule for the Saturday listing and view only the alternate program during school time.